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A N
E S S A Y
O N
CULINARY POISONS.
C O N T A I N I N G
C A U T I O N S
R E L A T I V E T O T H E
U S E o f L A U R E L - L E A V E S ,
H E M L O C K , M U S H R O O M S , C O P P E R - V E S S E L S ,
E A R T H E N J A R S , &c.

W I T H
Observations on the ADULTERATION of BREAD
and FLOUR,
And the NATURE and PROPERTIES of WATER.

Unde famis homini vetitorum tanta ciborum ?
Audetis yesci, genus ô mortale ? quod, oro,
Ne facite ; et monitis animos advertite nostris.

OVID. MET. xv. 138.

L O N D O N .
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P R E F A C E.

MANKIND are subject to innumerable diseases, from which other animals are exempted. But from whence do these diseases arise? From the seeds of mortality in the human frame? From luxury and intemperance? Or from an indiscreet use of vegetable and mineral poisons in the preparation of our food? --- From the last of these sources we certainly derive many troublesome, and sometimes fatal disorders: so that, on many occasions, we may exclaim with the sons of the prophets*, "There is death in the pot!"

* 2 Kings iv. 40.

The

The design of this publication is to guard people against these disasters ; and, if possible, to prevent some of the calamities of human life. If it should answer this useful purpose, the author's ambition will be fully gratified.



ON

CULINARY POISONS.

i. The LAURO-CERASUS, or Common LAUREL.

THE water distilled from the leaves of this tree has been frequently mixed with brandy, and other spirituous liquors, in order to give them the flavour of ratifia; and the leaves are often used in cookery, to communicate the same kind of taste to cream, custards, puddings, and some sorts of sweetmeats: But, in the year 1728, an account of two women dying suddenly in Dublin, after drinking some of the common distilled laurel water, gave rise to several experiments, made upon dogs, with the distilled water, and with the infusion of the leaves of the

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lauro-

lauro-cerasus, communicated by Dr. Madden, physician at Dublin, to the Royal Society in England, and afterwards repeated (in the year 1731) and confirmed by Dr. Mortimer, F. R. S. by which it appeared, that both the water and the infusion brought on convulsions, palsy, and death, when taken by the mouth, or anus *.

Dr. Mead † speaks of the foregoing accident and experiments in these terms : “ A small quantity of this water killed two women, who drank it, very suddenly. Hereupon a learned physician, surprised at the event, (this plant having never been thought to be any wise noxious) made several experiments with it upon dogs, which were afterwards, some of them, repeated here, with the same fatal success.”

Dr. Mortimer affirms, “ that laurel-water is equally mortal with the bite of the rattle-snake, and more quick in its operations than any mineral poison.”

* See Philosophical Transactions, No. 418, and 420.

† Mead on Poisons, Essay v.

Dr. James says: "laurel-water is the most deleterious poison perhaps known, killing almost instantaneously †."

The laurus of the ancients, or the *bay*, is, on the contrary, of a salutary nature, and of use in several disorders.

It may be said, that the laurel in custards, and other articles of cookery, is used in very small quantities, and has never been attended with any pernicious effect.—But, I ask, who can pretend to assert, that it has not occasioned some latent disorder, or some complaints, which have been ascribed to other causes? What person of sense or prudence would trust to the discretion of an ignorant cook, in the use of a dangerous ingredient in his puddings or custards? Or, who, but a madman, would choose to season his viands with poison?

The remedy is from ten to forty drops of sal ammoniac, in a glass of water, repeated as the symptoms may require.

† James's Dispensatory, book iii. c. 1. p. 228.

2. Small HEMLOCK, or FOOL'S PARSLEY.

DESCRIPTION.

The first leaves are divided into numerous small parts, which are of a pale green, oval, pointed, and deeply indented. The stalk is slender, round, upright, striated, and about a yard high. The flowers are white, growing at the tops of the branches in little umbells. It is an annual plant, common in orchards and kitchen gardens, and flowers in June and July. This plant has been often mistaken for parsley: and from thence it has received the name of *Fools Parsley*.

Though it seems not to be of so virulent a nature as the larger hemlock, yet Boerhaave places it among the vegetable poisons, in his Institutes; and, in his History of Plants, produces an instance of its pernicious effects ‡. It is therefore

‡ Institutes, § 1138, Hist. of Plants, p. 93.

fore necessary to guard against it in collecting herbs for salads, and other purposes.

3. M U S H R O O M S.

Mushrooms have been long used in sauces, in ketchup, and other forms of cookery. They were highly esteemed by the Romans, as they are at present, by the French, Italians, and other nations.

Pliny exclaims against the luxury of his countrymen in this article ; and wonders, what extraordinary pleasure there can be, in eating such *dangerous food**. The ancient writers on the *Materia Medica* seem to agree, that mushrooms are in general unwholesome ; and the moderns, Lemery, Allen, Geoffroy, Boerhaave, Linnæus, and others, concur in the same opinion. There are numerous instances upon record of their fatal effects.

Al-

* *Quæ voluptas tanta acripis cibi?* Plin. Nat. Hist. xxii, 23.

Almost all of them, as the last-mentioned author affirms, “ are fraught with poison †.”

The common esculent kinds, if eaten too freely, frequently bring on heart-burns, sicknesses, vomitings, diarrhœas, dysenteries, and other dangerous symptoms. It is therefore to be wished, that they were banished from the table. But, if the palate must be indulged in these treacherous gratifications, or, as Seneca ‡ calls them, this “ voluptuous poison”, it is necessary, that they, who are employed in collecting them, should be extremely cautious, lest they should collect such as are absolutely pernicious ; which, considering to whose care this is generally committed, may, and undoubtedly has, frequently happened §.

† *Fungi plerique VENENO TURGENT.* Linnæi *Amæn.*
Acad. vol. 1.

‡ *Quid tu illos boletos, VOLUPTARIUM VENENUM, nihil
occulti operis judicas facere, etiam si præsentanei non fu-
rant?* SEN. EP. 95.

§ See Gentleman’s Magazine, December, 1755 ; and Sup-
plement, September, 1757.

The eatable mushrooms at first appear of a roundish form, like a button ; the upper part and the stalk are very white ; the under part is of a livid flesh-colour ; but the fleshy part, when broken, is very white. When these are suffered to remain undisturbed, they will grow to a large size, and expand themselves almost to a flatness, and the red part underneath will change to a dark colour.

COPPER VESSELS.

Copper, when it is handled, yields an offensive smell, and if touched with the tongue, a sharp pungent taste, and even excites a nausea. Verdigris is nothing but a solution of this metal by vegetable acids. And it is well known, that a very small quantity of this solution will produce cholicks, vomitings, intolerable thirst, universal

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convulsions, and other dangerous symptoms. If these effects, and the prodigious divisibility of this metal be considered, there can be no doubt of its being a violent and subtile poison. We are daily exposed to this poison by the present use of copper vessels for dressing our food. The very air of the kitchen, abounding with oleaginous and saline particles, penetrates and disposes them to dissolution, before they are used. Water, by standing some time in a copper vessel, is impregnated with verdigris, as may be demonstrated by throwing into it a small quantity of any volatile alkali, which will immediately tinge it with a paler or deeper blue, in proportion to the rust contained in the water. Vinegar, apple-sauce, greens, oil, grease, butter, and almost every other kind of food, will extract the verdigris in a greater degree. It is true, people imagine, that the ill effects of copper are prevented by its being tinned: but the tin, which adheres to the copper, is so extremely thin, that it is soon penetrated by the verdigris, which insinuates itself through the pores of that metal, and appears green upon the surface.

M. Amy,

M. Amy, of the Academy of Sciences at Paris, observes, that "verdegris is one of the most violent poisons in nature :" yet, says he, " rather than quit an old custom, the greater part of mankind are content to swallow some of this poison every day". Amy's Treat. upon Cisterns, printed at Paris, 1750.

M. Thiery, in a thesis, which is added to this tract, has more particularly considered the noxious qualities of copper, and the various means, by which they may be communicated to whatever we eat or drink. "Our food, says he, receives its quantity of poison in the kitchen, by the use of copper pans and dishes. The brewer mingles poison in our beer, by boiling it in a copper. Salt is distributed to the people from copper scales, covered with verdegris." Pickled cucumbers are rendered green by an infusion of copper coin. "The pastry-cook bakes our tarts in copper patty-pans. But confections and syrups have greater powers of destruction : for they are set over a fire in copper vessels, which have not been tinned ; and the verdegris is plentifully extracted by the acidity of the composition. And though we do not, after all, swallow

death in a single dose, yet it is certain, that a quantity of poison, however small, which is repeated with every meal, must produce more fatal effects, than is generally believed".

Bell-metal kettles are very often used in boiling cucumbers for pickling, in order to make them green. This is an absurd and dangerous practice. If the cucumbers acquire any additional greenness by the use of these kettles, they can only derive it from the copper, of which they are made.;

According to some writers, bell-metal is a composition of tin and copper, or pewter and copper, in the proportion of twenty pounds of pewter, or twenty-three pounds of tin, to one hundred weight of copper. According to others, this metal is made of copper, a thousand pounds; tin, from two to three hundred pounds; and brass, one hundred and fifty pounds *.

Spoons and other kitchen utensils are frequently made of a mixed metal, called alchemy; or, as it is vulgarly pronounced, ockimy. The rust of this metal, as well as the former, is highly pernicious,

* Lord Bacon's Phys. Remains.

White alchemy is made of pan-brass, one pound; and arsenicum, three ounces. Red alchemy is made of copper, and auripigmentum, or orpiment †.

The author of a tract, entitled, Serious Reflections on the dangers attending the use of copper vessels, published at London in 1755, asserts; that “ the greater frequency of palsies, apoplexies, madness, and all the frightful train of nervous disorders, which suddenly attack us, without our being able to account for the cause, or which gradually weaken our vital faculties, are the poisonous effects of this pernicious matter, taken into the body insensibly with our victuals, and thereby intermixed with our blood and juices”.

However this may be, it is certain, that there have been innumerable instances of the pernicious consequences of eating food dressed in copper vessels, not sufficiently cleaned from this rust. On this account the Senate of Sweden, about the year 1753, prohibited copper vessels, and ordered, that none, but such as were made of iron, should be used in their fleets and armies.

† Lord Bacon's Phys. Remains.

But if copper vessels are still continued, every cook and good housewife should be particularly careful in keeping them clean and well tinned ; and should suffer nothing to remain in them longer, than it is absolutely necessary for the purpose of cookery.

R E M E D Y.

“ The common cure, says Dr. Mead, of all poisons taken into the stomach, must be by throwing them up again, by vomiting, as soon as possible, and defending the membranes from their pungent acrimony. Drinking very large quantities of warm milk, with oil of sweet almonds, till the vomiting ceases, will answer the first intention. The other, in mineral poisons, (for the effects of vegetable poisons, after they have been vomited up, generally go off by diluting plentifully with soft and fat liquids) requires particular care, which may be in this way. The force of these depends upon a combination of metallic particles with saline crystals : therefore the disuniting of these must destroy their power. This may

may be done by drinking a quantity of a lixivium made by a solution of salt of tartar in water: for this salt, uniting with the corrosive crystalline salt, will, after some degree of effervescence, kill it, as the chemists speak; by which means, being disengaged from the mineral globules, it will be rendered of no effect”*.

The SOLUTION or SALT of LEAD.

Lead is a metal easily corroded, especially by the warm steams of acids, such as vinegar, cyder, lemon-juice, rhenish wine, &c. And this solution, or salt of lead, is a slow and insidious, though certain poison. The glazing of all our common brown pottery ware, is either lead or lead ore. If black, it is lead ore, with a small proportion of manganese, which is a species of iron ore. If yellow, the glazing is lead ore, and appears yellowish by having some pipe or white clay

* Mead on Poisons, Essay iv.

clay under it. The colour of the common pottery ware is red, as the vessels are made of the same clay with common bricks. These vessels are so porous, that they are penetrated by all salts, acid or alkaline, and are unfit for retaining any saline substance. They are improper, though too often used, for preserving sour fruits or pickles. The glazing of such vessels is corroded by the vinegar; for, upon evaporating the liquor, a quantity of the salt of lead will be found at the bottom. A sure way of judging, whether the vinegar, or other acids, have dissolved part of the glazing, is, by their becoming vapid, or losing their sharpness, and acquiring a sweetish taste by standing in them for some time: in which case the contents are to be thrown away as pernicious.

The substance of the pottery ware commonly called Delft, the best being made at Delft in Holland, is a whitish clay when baked, and soft, as not having endured a great heat in baking. The glazing is a composition of calcined lead, calcined tin, sand, some coarse alkaline salt, and sandiver; which being run into a white glass, the white colour being owing to the tin, is afterwards ground

ground in a mill, then mixed with water, and the vessels, after being baked in the furnace, are dipped into it, and put into the furnace a second time ; by which means, with a small degree of heat, the white glass runs upon the vessels. This glazing is exceedingly soft and easily cracks. What effects acids will have upon it, the author of these observations cannot say, not having tried them : but they seem to be improper for insipidating the juice of lemons, oranges, or any other acid fruits.

The most proper vessels for these purposes are porcelain or china ware. The substance of them is of so close a texture, that no saline, or other liquor, can penetrate them. The glazing, which is made likewise of the substance of the china, is so firm and close, that no salt or saline substance can have the least effect upon it. It must, however, be observed, that this remark is only applicable to the porcelain made in China : for some species of the European manufactory are certainly glazed with a fine glass of lead, &c.

Next to china is the stone ware, commonly called the Staffordshire ware. The substance of these

these vessels is a composition of black flint, and a strong clay, that bakes white. Their outsides are glazed by throwing into the furnace, when well heated, common or sea salt decrepitated ; the steam or acid of which, flying up among the vessels, vitrifies the outsides of them, and gives them the glazing. This stone ware does not appear to be injured or affected by any kind of salts, either acid or alkaline, or any liquors, hot or cold. They are therefore extremely proper for all common uses, but require a careful management, as they are much apter to crack with any sudden heat, than china.

The Hessian ware, or the vessels made of the same substance with the Duke d'Alva's bottles, commonly called grey-beards, seem to be made of strong pipe clay, mixed with sand, and glazed in the baking, by the alkaline salt, which arises from the wood used in baking them, wood having always the effect, when the furnace is intense, to vitrify the outside of all clays*.

* *Dissert. by James Lind, M. D.*

REMARKS on the ADULTERATION
of BREAD and FLOUR.

Extracted from a Treatise “ On the nature of bread, honestly and dishonestly made”, published in 1757, by JAMES MANNING, M. D.

The author tells us, that in the sophistication of flour, mealmen and bakers have been known to use bean meal, chalk, whiting, flaked lime, alum, and even ashes of bones. The first, bean flour, is perfectly innocent, and affords a nourishment equal to that of wheat; but there is a toughness in bean flour, and its colour is dusky. To remove these defects, chalk is added to whiten it, alum to give the whole compound that consistence, which is necessary to make it knead well in the dough, and jalap to take off the astringency. It may be supposed, that these horrid iniquities are only imaginary, or at least exaggerated, and that such mixtures must

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be discoverable even by the most ordinary taste ; but as some adulterations of this nature have certainly been practiced, the following experiments may serve to gratify curiosity, or discover frauds, where any such exist.

“ To discover whether flour be adulterated with whiting or chalk, mix with it some juice of lemon or good vinegar. If the flour be pure, they will remain together at rest ; but if there be a mixture of whiting or chalk, a fermentation, like the working of yeast, will ensue. The adulterated meal is whiter and heavier than the good : the quantity that an ordinary tea-dish will contain, has been found to weigh more than the same quantity of genuine flour, by four drachms, and 19 grains, Troy.

“ The regular method to detect these frauds in bread is this : cut the crum of a loaf into very thin slices ; break them, but not into very small pieces, and put them into a glass cucurbit, with a large quantity of water. Set this, without shaking, in a sand furnace, and let it stand, with a moderate warmth, four and twenty hours. The crumb of the bread will in this time soften in all its

its parts, and the ingredients will separate from it. The alum will dissolve in the water, and may be extracted from it in the usual way. The jalap, if any have been used, will swim upon the top in a coarse film, and the other ingredients, being heavy, will sink to the bottom. This is the best and most regular method of finding the deceit ; but as cucurbits, and sand furnaces, are not at hand in private families, there is a more familiar method.

“ Let the crum of a loaf be sliced as before directed, and put it, with a great deal of water, into a large earthen pipkin. Let this be set over a very gentle fire, and kept a long time moderately hot ; and the pap being poured off, the bone ashes, or other ingredients, will be found at the bottom.”

On W A T E R.

Observations on Water, extracted from Dr. Rotherham's Philosophical Enquiry, &c.

IT is a long established observation, that the best waters boil and cool again the soonest; and that they evaporate in the least time, and with the least degree of heat.

A well known mark of the purity of water is its softness. This quality is discoverable by the touch, if we only wash our hands in it: and the distinction between hard and soft water generally arises from its difficult or easy union with oily substances,

Soft water is the most proper for the washing and bleaching of linen, the making of paper, and for most medicinal purposes. It mixes more uniformly with milk, and does not curdle it, as hard waters frequently do. It boils pease and beans softer, and mixes better with flour, rice, oatmeal, &c. In boiling meat it gives it a more agreeable colour than hard water, which often boils it red.

There are however some purposes, to which hard water is more proper: as, in several kinds of dying; in making starch; and in the rinsing of soap out of linen, after it has been washed; as it is observed to give the linen a better colour, and an agreeable firmness or crispness; but the linen thus treated requires more soap, when it comes to be washed again. Hard water gives a better colour to greens, and a firmness to all sorts of fish, especially cod, when boiled in it.

The Burton, Nottinghamshire, Liverpool, and several other kinds of ale, which are much admired, are said to be brewed with hard water. But Dr. Mead and others condemn the use of these liquors, as productive of various disorders, and particularly the cholic.

From

From these remarks we may reasonably infer, that hard water cannot so well answer the purposes of diluting and digesting our food; as it will not so readily mix and unite with the different parts of it, nor assimilate and digest them properly. Besides the large quantities of acid and nitrous salts, with the loads of selenite and calcareous earth, which these waters generally contain, will naturally dispose them to form obstructions, when, by the course of circulation, these solid particles come into the minutest vessels, more especially those of the glands. Hence they are often blamed, as laying the foundation of scrophulous, strumous, and other glandular swellings and obstructions.

It is from the quantity of stony matter, which the hard waters generally contain, that most of them have large incrustations upon the sides of the vessels, in which they are boiled; and they have by some been disapproved for this reason, as causing the stone. But the calculous concretions in the bladder and kidneys are of a very different nature from these incrustations; and, as Dr: Heberden justly observes, " they totally differ from all fossil stones in every thing except the name; and the

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pretended experience of the effects of certain stony waters in breeding the stone, may, upon the best authorities, be rejected as false*.

The best way of determining the hardness or softness of water, is by scraping any certain quantity of soap into it, and observing how it dissolves or lathers. If water be perfectly soft, the soap will dissolve quickly, uniformly, and without curdling ; and, upon shaking the glass briskly, will raise a strong froth or lather at the top. But the smallest degree of hardness will shew itself, either by the soap not dissolving so readily, by its turning curdly and uneven, or by less froth remaining after it is agitated ; and the different degrees of hardness may hereby be very well determined. The best way of making this trial is with a small quantity of Castile soap, viz. about a grain to an ounce of water.

R A I N - W A T E R.

In summer-time rain-water brings along with it the seeds and embryos of vegetables and animalcula,

† Medical Transl. by the Coll. of Phys. vol. 1. p. 7.

malcua, which render it disagreeable to the taste, and promote its putrefaction. If it be kept in wooden vessels, it will soon stink, and become unfit for use ; and then, if it be viewed with a microscope, it will be found to contain an amazing number of various animalcula ; and particularly those, which, from their form and motion, are called the wheel animals*. These animalcula are supposed to be the chief cause of the water's putrefaction.

Rain water is a little hard, when it first falls ; but in two or three days it becomes perfectly soft.

The rain, which falls through the smoke of large towns, is rendered foul and black ; more especially if it be collected, as it generally is, from the roofs of houses ; when it brings with it a great many particles of soot, which give it a very disagreeable taste and colour. Where the tiles are blackened by the smoke of glass-houses, &c. the water,

* Baker's Microscope made easy, p. 83. Employment for the Microscope, p. 295.

water, which falls from them, is unfit for almost any domestic purposes.

When rain-water subsides, and is well filtered, it becomes perfectly clear and bright. If it be kept in wooden vessels, it contracts a particular smell, taste and colour from the wood.

Clean earthen jars are the best for keeping water. Though leaden cisterns may be used with safety, if they be kept clear from vegetable acids; all of which are found to corrode lead, and to produce a very noxious salt. The vessels, in which water is preserved, should be covered, to prevent any dust or filth from getting in; and the water will be more agreeable, if kept in a cool place.

S N O W - W A T E R.

Some of the greatest philosophers and physicians have differed much in their opinion of snow-water. Hippocrates, Hoffman, and others, condemn it: But Boerhaave, on the other hand, is

lavish in its encomiums. He asserts, that snow, which is collected from the tops of high sandy mountains, at a distance from any towns or houses, where it has fallen after a long sharp frost, in calm weather, and lies at a considerable height above the surface of the earth, produces water, " which is the purest of all, quite immutable, capable of being kept for many years, and is a singular remedy for inflammations of the eyes" *.

Dr. Rotheram having mentioned the efficacy of snow-water in burns, and in fertilizing the ground, relates the following experiment, which, though it may appear of a trivial nature, he very justly remarks, is not below the notice of a philosopher.

" One effect of snow, of which I do not remember any where to have read, is, that a certain quantity of it, taken up fresh from the ground, and mixed in a flour-pudding, will supply the place of eggs, and make it equally light. The quantity allotted is two table spoonfuls, instead of one egg ; and if this proportion be much exceeded, the pudding will not adhere together, but will fall to pieces in boiling. I assert this from the experience

* Boerh. Chem. vol. 1. p. 349. London edit. 1735.

rience of my own family; and any one, who chooses to try it, will find it to be a fact".

S P R I N G W A T E R.

As all our springs are originally supplied by rain, or melted snow, and hail, strained through the pores and cavities of the earth, their waters will vary according to the different soils, or strata, through which they pass. If waters meet with nothing in their subterraneous passages, which will unite with them, or dissolve in them, they issue out in their greatest purity. The springs, which come from gravel, sand, or some light and porous stones, are generally the purest, and best; for the water being filtered through their small pores, is cleared from almost every foreign substance or impurity, which it had contracted in the air; acquires an agreeable coolness, and becomes limpid, bright, and sparkling.

But, as there are few soils, which do not contain some kinds of salt, or other mineral substances, which are soluble in water, most of our springs are found to partake, in some measure, of

the nature of the soil, through which they pass, and are innocent, salutary, or noxious, in proportion to the quantity, kind, or mixture, of the various ingredients, of which they are composed ; and the constitution, of the person, who uses them : and some of them are of great medicinal efficacy.

S T A G N A N T W A T E R.

Stagnant water in ponds and ditches is generally esteemed the worst. But large lakes, which are kept in almost a continual agitation by the wind, do not properly come within the denomination of stagnant waters.

P U M P W A T E R, especially in L O N D O N.

It appears from the analysis performed by Dr. Heberden †, that several pump waters in London, which he had examined, and probably most of

† See Medical Transact. vol. 1.

of them, contain powder of lime-stone, and the mineral acids of vitriol, nitre, and sea-salt, united in various proportions. These waters are likewise tainted with an oiliness, which gives them a remarkably yellowish cast, when compared with pure distilled water. It is reasonable to think, that waters impregnated with such active substances, in a quantity sufficient to render them disagreeable to the taste, cannot always be drunk with impunity. They have accordingly been suspected of occasioning pains in the stomach and bowels, glandular tumors and costiveness, where the simple lime-stone prevails ; and diarrhoeas, where much of it is united with the solution of acids ; and it is probable, that a continued use of such water may be the cause of many other disorders, especially to the infirm, and to children. From whence it follows, that a change of place may often be of as much use to weak persons, from the change of water, as of air.

Some obscure notion of the unwholesomeness of pump water, induces many persons to boil it, and let it stand to grow cold ; by which it will indeed be made to part from most of its unneutralized lime-stone and selenite ; but at the same time it will become more strongly impregnated

nated with the saline matter, and therefore it will be worse.

If a small quantity of salt of tartar were added to the water, it would readily precipitate both the loose lime-stone, and likewise that which is united to the acids. Ten or fifteen grains would generally be enough for a pint ; but the exact proportion would readily be found, by continuing to add to it, by little and little, till it ceased to occasion white clouds. This is an easy way, not only of freeing the water from its lime-stone, but also of changing the saline part into nitre and sylvii, both of which we know, by long experience, to be innocent.

But the best way of avoiding the bad effects of pump water would be, not to make a constant use of it ; and in a place so well supplied with river water as London, there is very little necessity to drink of the springs, which in so large a city, besides their natural contents, must collect many additional impurities from cellars, burying-grounds, common-sewers, and many other offensive places, with which they undoubtedly often com-

communicate ; so that it is indeed a wonder, that we find this water at all tolerable *.

THAMES and NEW-RIVER WATER.

River waters partake of the properties of their springs, and the channels, through which they run ; yet, in a wonderful manner, they soon free themselves from their impurities. The motion of the current †, the absorption of the soil, the sun and rain, have each of them a considerable share in this effect.

The Thames water, especially in the neighbourhood of London, is mixed with many impure ingredients. It is said to become offensive in seven or eight days, or sometimes sooner, if it be kept in unseasoned casks. In this state it generates a quantity of foul inflammable air, as may be seen by holding the flame of a candle to the bung-hole of a cask when it is first opened. But

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* See Medical Transact. vol. 1.

† The most rapid rivers contain, *cæteris paribus*, the purest water.

by this fermentation it soon purifies itself; and by opening the bung, it will often become sweet in twenty-four hours, and sooner, if it be poured from one vessel to another, or ventilated *.

METHODS, BY WHICH WATER MAY BE OBTAINED IN ITS GREATEST PURITY.

As it appears, that almost all the water used in cookery is tainted with impure ingredients; rain water, with a great variety of volatile bodies, fuliginous particles, exhalations, invisible seeds, and insects; river, pond, and well water, with a mixture of soil and mud, decayed vegetables, and the spawn of vermin, it will be very proper to purify it, before it is used for drinking, or any culinary purpose. This may be done by various contrivances.

i. The water of the Thames, and that of the New River, are very often muddy, or taste strongly of weeds and leaves. Dr. Heberden acknowledges, that the latter fault cannot easily be re-

* Philos. Trans. No. 127, 268. Boerh. Elem. of Chem. vol. 1. p. 333. Rotheram's Philos. Inquiry.

remedied ; but, he observes, they would soon be freed from their muddiness, if kept some time in an open jar : and he is of opinion, that if the water given to very young children, were thus purified, it might prevent some of their bowel-disorders, and so contribute a little to lessen that amazing mortality among the children, which are nursed in London.

2. Rain water, when grown putrid, as Boerhaave assures us, may be easily rendered wholesome again, and may be drunk without being offensive, by only boiling it a few moments : for by this expedient, the animals that are in it will be destroyed, and, with the rest of the impurities, will subside to the bottom. If then, says he, you make it moderately acid, by adding to it a small quantity of acid that is very strong, it will be fit for use. This is found to be of excellent service under the Equator, and between the Tropics, where the waters putrify in a horrible manner, and breed a multitude of insects, and yet must be drunk. For the same reason, a small quantity of spirit of vitriol, mixed with water, will prevent its growing putrid, and breeding any animals, and,

at the same time, preserve it wholesome and good *.

3. A common way of purifying water is by filtration. Water, which is filtered through porous stones, is extremely clear and limpid ; but some writers have asserted, that it acquires a petrifying quality in its passage, which, at length, may produce disagreeable effects †. However this may be, these stones are too dear for common use.

Dr. Rotheram asserts, that one of the readiest and best methods of filtering water, is, to let it run through a bed of clean sand. This is, he says, preferable to the filtering-stone, as it performs its work much sooner ; and the grains of sand are of so many different figures, that they are pretty sure to stop the progress of any bodies of sensible bulk, in passing through them §.

* Boerh. Chem. vol. 1. p. 348.

† M. Amy on Cisterns ; but see above, p. 31.

§ If you view ten thousand grains of sand through a microscope, you will scarcely find two of the same size and shape. Rotheram's Philosophical Inquiry, p. 48.

“ A friend of mine, says the Doctor, in this town [Newcastle] has a cistern for collecting rain water, so constructed, that it both allows the water to subside, and the upper part of it to run through a bed of sand, which is raised by a partition above the bottom of the cistern; by which means the water becomes perfectly clear and bright, and is preferred by most who have tasted it, to any other water in this town”.

4. Some have objected, but probably without reason, to this mode of filtration, on a presumption, that the sand has the same effect on the water as the filtering stone: for it is said, that the sand is insensibly dissolved by the water; so that in four or five years it will have lost a fifth part of its weight. M. Amy therefore recommends the filtration of water through a sponge, more or less compressed. And this, he assures us, will render it, not only more clear, but more wholesome, than either a stone or sand.

5. As the purest of all water is obtained by distillation, Dr. Heberden recommends this method, as particularly useful where fuel is cheap,

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and the water is bad ; as it is in some of our foreign settlements.

The first running of distilled water has a disagreeable musty taste : on this account, if the still hold twenty gallons, it will be necessary to throw away the first gallon. The rest, though free from this mustiness, will have a disagreeable empyreumatic or burnt taste. This taste goes off by keeping about a month, by ventillation; in a few minutes, or by boiling the water in an open vessel. Distilled water must be kept in perfectly clean glass or stone bottles, with glass stoppers, or metal covers ; and then, having in it no principle of corruption, it is incapable of being spoiled, and will keep just the same for ever. But the least particle of any animal or vegetable substance, will spoil a great quantity ; and therefore the still and bottles should be kept wholly for this use.

This process, though certainly attended with many good effects, requires too much time and attention for common use ; and therefore, in general, it may be sufficient to adopt the mode
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of filtration, recommended by Dr. Rotheram, or that which is proposed by M. Amy.

The observations, which I have here laid before the reader, are not new. They have been communicated to the public by others. But they are dispersed through many different publications. I have therefore thrown them into a small compass. And I flatter myself, that, in this commodious form, they may be acceptable to the public; as many of the foregoing articles are of infinite importance to the health, and consequently to the happiness of mankind.

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